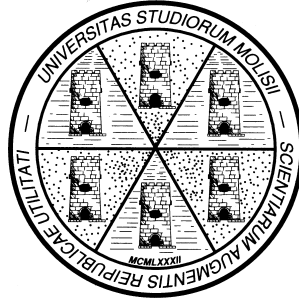


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### **Average Labor Taxes and Unemployment: Evidence from Italian Regions**

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# Average Labor Taxes and Unemployment: Evidence from Italian Regions<sup>1</sup>

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### **Abstract**

By focusing on the Italian experience, we ask whether the relationship between labor taxes and unemployment varies across regions. In spite of similar national labor market institutions, we show that this relationship is significantly stronger in the highly industrialized North than in the less developed South, where unemployment is much higher. An important source of variation in the regional responsiveness of unemployment originates from the fact that regional gross wages in the North increase more than in the South in response to a hike in labor taxes.

- JEL: J51, H20
- Keywords: regional unemployment, labor taxes

# 1 Introduction

A popular explanation of the observed differences in the behavior of the rate of unemployment across European countries focuses on the interaction of negative shocks with national institutions (Blanchard and Wolfers, 2000). These institutions include employment protection measures, the unemployment benefits system and the degree of centralization of the wage bargain. In a recent example of this approach, Daveri and Tabellini (2000) show that the impact of labor taxes on the rate of unemployment depends on the national institutions regulating wage bargaining. In particular, they argue that the impact of higher labor taxes is lower in countries where bargaining is either decentralized (Anglo-Saxon countries) or very centralized (Scandinavian countries). Most continental European countries have wage setting institutions that lie between these two extremes: in these countries the negative impact of an increase of labor taxes on unemployment is highest.

In this literature, the empirical evidence is based on comparisons of aggregate data across countries. Moreover, labor market institutions have a national dimension. A key feature of unemployment in some continental European countries in the 1980s and 1990s — most notably Italy and Spain, but also Germany — however, has been the high dispersion of regional unemployment rates (see Jimeno and Bentolila, 1998, for Spain and Brunello, Lupi and Ordine, 2001, for Italy). The fact that average unemployment and the dispersion of regional unemployment rates have both increased suggests that there can be important within-country differences in the interaction between shocks and institutions that are overlooked by the conventional approach that focuses only on national data.

In this paper we study the long run relationship between regional unemployment and regional labor taxes and ask whether this relationship varies significantly across groups of regions. Our empirical study focuses on the Italian experience. We believe that Italy, with its high regional unemployment dispersion and rising labor taxes, provides an interesting case study.

In spite of similar national labor market institutions, we find that the relationship between unemployment and labor taxes in Italy is significantly

stronger in the highly industrialized North than in the less developed South. A key source of variation in the regional responsiveness of unemployment to changes in labor taxes is that regional gross wages in the North increase more than in the South in response to a hike in labor taxes. We explain part of the higher sensitivity of gross wages in the North with composition effects (between industrial sectors) and argue that the residual part can be accounted by regional differences in the relative importance of the wage drift.

The paper is organized as follows. In the next section we present a simple two-equation model that describes the equilibrium relationship between labor taxes and unemployment and provides a guide for the empirical analysis. In section 3 we introduce the data. The next two sections are devoted to the empirical evidence on the relationship between labor taxes and regional unemployment and between labor taxes and regional gross wages. Section 5 explores how regional institutions can help explaining our results. Conclusions and policy implications follow. Three appendices complement the paper. The first is a technical appendix that discusses in some detail the theoretical links between taxes and regional wage determination. Appendices B and C deal with data sources and the estimation of the labor tax wedge, respectively.

## 2 The Model

Following the approach popularized by Layard *et al.* (1991), we characterize the long run evolution of regional labor markets with a pair of equations, a regional (pseudo) labor demand and a regional wage setting equation. We ignore labor mobility between regions, which has been very limited since the early 1970s.<sup>1</sup> The general theoretical model is illustrated in detail in Appendix A. Here we adopt the simplifying assumption that the elasticity of substitution in the production function is equal to unity (Cobb Douglas). Real regional value added is assumed to depend on regional labor and on the

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<sup>1</sup>The out-migration rate from the South which characterized the 1960s fell substantially in the early 1970s and remained low during the 1980s and the 1990s: see Brunello, Lupi and Ordine (2001) and the references therein.

real price of energy (see Bruno, 1984). Firms operating in monopolistically competitive markets set employment and prices by taking factor prices as given and by maximizing profits. This is equivalent to equating the product of the real product wage by the price markup to the marginal product of labor. Let the price markup be a function of the real interest rate, as in Phelps (1994). Using small letters for logs, employment is defined by

$$e_{it} = \alpha_0 - \alpha_1 p_{mt} - \alpha_2 R_{it} - \alpha_3 (w - p)_{it} \quad (1)$$

where  $i$  is for the region and  $t$  for time,  $e$  is employment,  $p$  is prices,  $w$  is wages gross of taxes,  $R$  is the real rate of interest and  $p_m$  is the real price of energy.

In unionized labor markets, wages are set by bargaining between unions and employers. Unions care about wage gains over the expected alternative income and firms care about profits.<sup>2</sup> Bargaining can occur both at the sectorial and at the local level. A typical outcome of the bargain is that gross wages increase with the alternative option ( $\bar{w}$ ) and with labor productivity ( $y - e$ ) and decrease with the rate of unemployment ( $U$ ) (see Booth, 1995). A higher labor tax wedge increases gross real wages if there is real wage resistance and unions are able to shift part or all of the tax burden away from real net wages (see Pissarides, 1998, for a discussion).<sup>3</sup> Assuming that the alternative option is a function of the unemployment rate and of the opportunity value of time  $\zeta$  and using a log-linear form, regional gross wages are given by<sup>4</sup>

$$(w - p)_{it} = \beta_0 - \beta_1 U_{it} + \beta_2 \tau_{Lit} + \beta_3 \zeta + \beta_4 p_{mt} + \beta_5 R_{it} \quad (2)$$

where  $\tau_L$  is the log tax wedge, measured as a share of the gross wage.<sup>5</sup>

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<sup>2</sup>This is a standard assumption in the wage bargaining literature, see for example Layard *et al.*, 1991.

<sup>3</sup>In this paper we consider only average labor taxes. There is a small but increasing literature on the relationship between tax progressivity, wages and unemployment. See for instance Holmlund and Kolm (1995), Koskela and Vilmunen (1996), and Brunello and Sonedda (2002).

<sup>4</sup>With a Cobb Douglas specification the labor share is constant and output per head in the wage setting equation can be eliminated.

<sup>5</sup>The tax wedge is defined as (see Appendix A for details)  $\tau = [\bar{P}(1 + t)] / [P(1 - \phi)]$

If we normalize the regional labor force to unity,  $U_{it} = 1 - e_{it}$  and regional equilibrium unemployment is obtained by using (2) into (1), which yields

$$U_{it} = \gamma_0 + \gamma_1 \tau_{Lit} + \gamma_2 p_{mt} + \gamma_3 R_{it} + \gamma_4 \zeta_{it} \quad (3)$$

where  $\gamma$  are combinations of the parameters in (1) and (2) and

$$\gamma_1 = \frac{\alpha_3 \beta_2}{1 + \alpha_3 \beta_1}. \quad (4)$$

This simple model suggests that the equilibrium relationship between regional unemployment and the regional tax wedge depends on three parameters: 1) the sensitivity of the real gross wage to changes in  $\tau_L$ ,  $\beta_2$ ; 2) the sensitivity of the real gross wage to the unemployment rate,  $\beta_1$ ; 3) the sensitivity of employment to the real gross wage,  $\alpha_3$ .

### 3 The Data

The record on unemployment has differed markedly among Italian regions since the early 1970s. We plot in Figure 1 the average annual unemployment rate in the Northern (N from now on) regions and in the less developed South (S from now on) from 1965 to 1995.<sup>6</sup> The data clearly show that regional unemployment differentials have widened, especially since the mid 1980s (see Brunello, Lupi and Ordine, 2001, for a detailed discussion).

During the same period, the evolution of the average labor tax wedge, measured as the ratio between estimated labor tax payments and the average

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where  $P$  is the price for a firm operating in a monopolistic environment,  $\bar{P}$  is the average price,  $t$  is the share of payroll taxes on gross wages, and  $\phi$  is the share of income taxes. Then  $\ln(\tau) = \ln[(1+t)/(1-\phi)] + \ln(\bar{P}/P) = \tau_L + \ln(\bar{P}/P)$ , with  $\tau_L$  denoting the log labor tax wedge.

<sup>6</sup>We consider Piemonte, Lombardia, Trentino Alto Adige, Veneto, Friuli Venezia Giulia, Liguria and Emilia Romagna among the northern regions, and Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicilia and Sardegna among the southern ones. There are only two minor differences with respect to the conventional classification used *e.g.* by the National Statistical Institute (ISTAT): we do not consider Valle d'Aosta within the set of the northern regions because it is a tiny region with a special statute; we include Emilia Romagna among the northern regions because its productive structure is very similar to that of the northern area.

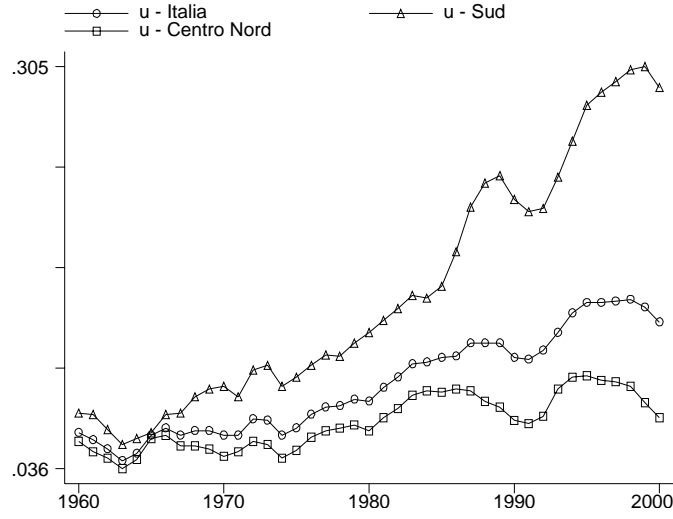


Figure 1: Unemployment rates by area.

gross wage, has also varied across regions (see Figure 2).<sup>7</sup> In particular, the payroll tax wedge after 1968 increased in the N regions and declined in the South: by the early 1980s, the gap between the two wedges was close to 9 percentage points, at less than 0.25 in the South and at close to 0.34 in the N regions.

During the 1980s and the early 1990s, the payroll tax wedge increased more or less at the same pace in both areas, and the gap remained close to 8 percentage points. As a result of these developments, the payroll tax wedge increased from 0.323 to 0.381 in the N areas and declined during the same period from 0.325 to 0.301 in the South. A broadly similar pattern emerges when we consider the total tax wedge (Figure 3), that includes both social security contributions paid by employees and labor income taxes. In this case, the gap between the two macro regions in 1995 was higher than 7 percentage points.

The significant gap in the regional labor tax wedge is explained by the

<sup>7</sup>We measure the labor tax wedge in the private sector  $\tau_L$  as social security contributions paid by employers and employees plus estimated income taxes paid by employees as a percentage of the gross wage. Details on the construction of the regional labor tax wedge are provided in Appendix C at the end of the paper.



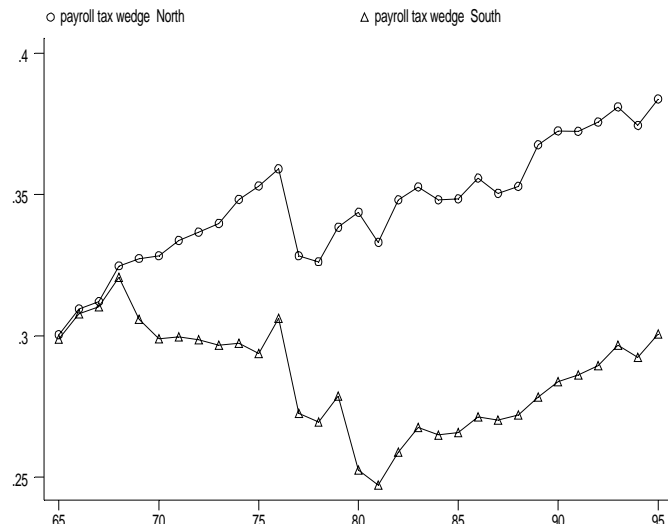


Figure 2: Payroll labor tax rates by area.

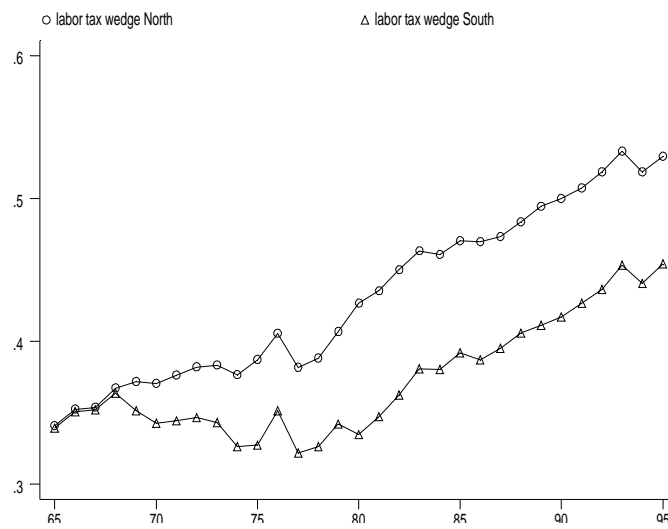


Figure 3: Labor tax wedge by area.

introduction of tax breaks targeted especially (albeit not exclusively) at the Southern regions in the late 1960s, when net wages in these regions started to increase after the abolition of regional differences in wage contracts (See Faini, 1993 and Malfatti, 1994, for a detailed discussion of these measures).

The figures suggest that in the past thirty years the rate of unemployment and the labor tax wedge in Italy have exhibited significant variation both over time and across groups of regions. We exploit this variation to investigate whether there are significant differences in the relationship between unemployment and labor taxes in the two areas of the country.

Since the evidence in Figures 1 and 3 suggests that average labor taxes have increased less in the regions where unemployment rates have increased most (the South), one is tempted to draw from this the conclusion that higher average labor taxes must have had a larger impact in the South than in the North of the country. Such a conclusion is unwarranted for at least two reasons: first, a direct causal relationship from labor taxes to unemployment needs to be established with the help of a theoretical model<sup>8</sup>; second, this relationship must take into account the fact that other variables can affect the unemployment rate in the long run.

One important candidate is the opportunity value of time  $\zeta$ . In this literature, it is standard to measure  $\zeta$  with unemployment benefits (see Layard *et al.*, 1991). An alternative option is to measure  $\zeta$  with real per capita income from social wealth,  $\zeta$  (Fitoussi *et al.*, 2000). The underlying idea is that the higher this income, the lower the incentive to work and the higher the wage that needs to be paid to attract workers from the unemployment pool to employment. Fitoussi *et al.* define  $\zeta$  as the real income from social assistance and social insurance, inclusive of unemployment benefits. We compute  $\zeta$  as the ratio of total (regional) social government transfers to the (regional) population. Social government transfers in our data include unemployment benefits, social assistance and pension income. The income associated to these transfers provides opportunities for intra-household re-

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<sup>8</sup>The theoretical model developed in Appendix A implies that this relationship depends on wage setting behavior, and that unemployment is more closely related to the tax wedge in those regions where the wage drift is more widespread, *i.e.* in the North of the country.

distribution from the retired old to the unemployed young and contributes to increasing the reservation wage attached to jobs.<sup>9</sup>

Since  $\zeta$  is dominated by pension income, one can think of other channels beside the reservation wage linking this variable to the equilibrium unemployment rate. One such channel is wage bargaining. When union membership is extended to pensioners, as it is in the case of Italy, and unions do not fully internalize the pay as you go constraint linking pension payments to payroll taxes, higher pension income is expected to reduce, *ceteris paribus*, the real wage, thereby reducing equilibrium unemployment. The main reason is that pensions can be considered as deferred compensation. We conclude that income from social wealth can have both positive and negative supply side effects on unemployment: on the positive side, it increases the reservation wage; on the negative side, it reduces current real wages by increasing future expected real compensation.

Figure 4 plots  $\zeta$  in the North and in the South of the country. The data show that real income from social wealth has increased rapidly in both areas, but especially in the North, where the majority of pension recipients live.

## 4 The Evidence

### 4.1 Labor Taxes and Unemployment

We have data on 15 regions (7 in the North and 8 in the South) for the period 1965-95 and start by estimating a dynamic version of (3) region by region.

The estimable model is an empirical dynamic analog of (3): using a standard notation we define

$$\alpha(L)u_{it} = c + \mathbf{x}_{it}\boldsymbol{\beta}(L) + \nu_{it} \quad (5)$$

where  $\mathbf{x}_{it} = (\tau_{Lit}, p_{mit}, \zeta_{it}, R_{it})$ ,  $u_{it}$  is the log of the unemployment rate and  $\nu_{it}$  are residuals.

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<sup>9</sup>Bentolila and Ichino (1998) discuss intra-household transfers in the context of Southern European unemployment. Manacorda and Moretti (2001) study how pension income affects the living arrangements of young Italians.

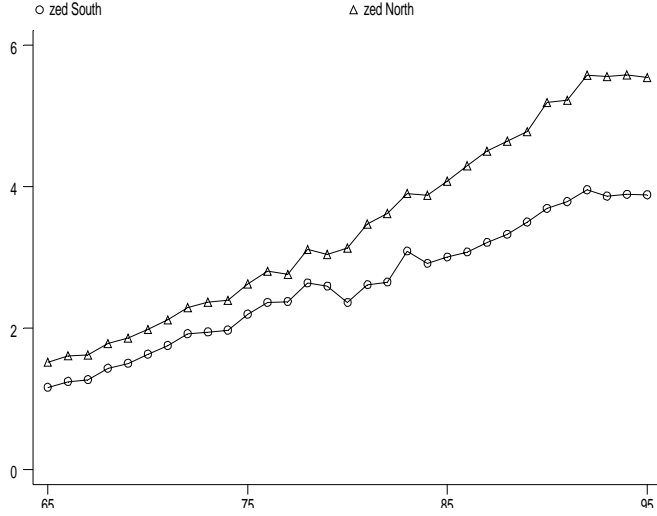


Figure 4: Real social transfers per head

In order to gain efficiency, the model is reparameterized and estimated as a (generalized) ECM (error correction mechanism). Lags are selected for each region by restricting a fairly long lag structure while maintaining "well-behaved" residuals. Since most of the variables in (5) are likely to be non-stationary, we test for cointegration using a version of the Banerjee, Dolado, and Mestre (BDM) test. We also compute exogeneity tests for the contemporaneous right hand side regressors. The exogeneity tests are based on the following procedure: the residuals of (pseudo) marginal models, specified in the form of VARs, are introduced in the conditional models, and the (joint) significance of the parameter(s) of the residuals is tested. Exogeneity is rejected when the parameters are significantly different from zero.

Our results are summarized in Table 1. The findings are broadly consistent with our previous work (see Brunello *et al.*, 2000) and indicate that, on average, the impact of the tax wedge in the N regions is more than double the average impact in the S regions. Using labor force weights, the average long run elasticity of unemployment to labor taxes is 3.897 (0.627) in the North and 1.142 (0.077) in the South.<sup>10</sup> The difference in the elasticities turns out

<sup>10</sup>Weighted standard errors within parentheses. We can retrieve the estimate of  $\gamma_1$  in (4) by multiplying the estimated long run elasticity in each area by average unemployment

to be significantly different from zero.

It is useful to compare these estimates to those obtained by Daveri and Tabellini (2000), Table 9, page 75, who find that in continental Europe the coefficient of labor taxes in the unemployment equation ranges between 0.29 and 0.54. Using the average values of unemployment and labor taxes by area, our elasticities imply that the estimated coefficient is 0.53 in the Northern regions and 0.39 in the South, within the range found by Daveri and Tabellini.<sup>11</sup> Compared to the findings in the literature (Nickell and Van Ours, 2000), these elasticities are quite large. They suggest that a 10% reduction in the labor tax wedge, given real income from social wealth, would reduce Northern equilibrium unemployment by 38.9% and Southern equilibrium unemployment by 11.4%.<sup>12</sup>

We also find that per capita real income from social wealth  $\zeta$  has a negative influence on unemployment in the North and a positive influence in the South. One explanation consistent with the simple model in the previous section is that the reservation wage effect prevails on the differed compensation effect in the South. The contrary occurs in the North.

The price wedge  $p_m$  appears to have been more important in the North, and has had a significant impact in the South only for Sardegna.<sup>13</sup> Finally, and only for three Northern regions, we find a negative association between the real rate of interest and regional unemployment. This result is, to some extent, puzzling and might indicate that real interest rates are not that important in determining regional unemployment rates.

Turning to the evidence in favor of cointegration among the variables in (5), results are more clear-cut for northern regions, where we find always

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in the area.

<sup>11</sup>In the North we have that  $\frac{\partial U}{\partial \Upsilon} = 3.897 \frac{0.058}{0.429} = .52687$ , where  $\Upsilon$  is the level of the labor tax wedge. In the South we obtain  $\frac{\partial U}{\partial \Upsilon} = 1.142 \frac{0.129}{0.375} = .39285$ .

<sup>12</sup>By equilibrium unemployment we mean the unemployment rate that would prevail in a steady state, when all short term variations, including changes in the rate of inflation, are set to zero.

<sup>13</sup>The regional variation of the real price of energy is essentially induced by the cross-regional variability of the value added deflator. The observed asymmetry can help explain the asymmetric behavior of regional unemployment from the 1980s onwards, when the real price of energy dramatically declined from the peak reached during the Iranian revolution.

Table 1: Static long-run parameters in regional regressions

| Region           | $\tau$  | $p_m$   | $\zeta$ | $r$     | UR       | Ex    |
|------------------|---------|---------|---------|---------|----------|-------|
| Northern Regions |         |         |         |         |          |       |
| Piemonte         | 3.621   | 0.160   | -0.710  |         | -4.179*  |       |
| (SE)             | (1.048) | (0.053) | (0.417) |         |          |       |
| Lombardia        | 5.895   | 0.215   | -1.712  | -0.040  | -4.895*  | 0.721 |
| (SE)             | (1.677) | (0.043) | (0.594) | (0.020) |          |       |
| Trentino A.A.    | 3.724   | 0.297   | -1.486  |         | -4.280*  | 0.300 |
| (SE)             | (1.336) | (0.073) | (0.623) |         |          |       |
| Veneto           | 2.181   | 0.220   | -0.682  |         | -6.286** | 0.546 |
| (SE)             | (0.457) | (0.023) | (0.208) |         |          |       |
| Friuli V.G.      | 3.878   | 0.216   | -0.992  |         | -7.275** | 0.187 |
| (SE)             | (0.405) | (0.021) | (0.177) |         |          |       |
| Liguria          | 1.942   | -0.040  | -0.023  | -0.032  | -4.948*  | 0.925 |
| (SE)             | (0.872) | (0.027) | (0.304) | (0.017) |          |       |
| Emilia R.        | 2.529   | 0.151   | -0.661  | -0.024  | -6.540** |       |
| (SE)             | (0.503) | (0.018) | (0.177) | (0.007) |          |       |
| Southern Regions |         |         |         |         |          |       |
| Abruzzo          | 0.626   |         | 0.394   | 0.011   | -4.268*  |       |
| (SE)             | (0.302) |         | (0.071) | (0.006) |          |       |
| Molise           | 2.161   |         | 1.095   |         | -2.248   | 0.502 |
| (SE)             | (0.949) |         | (0.204) |         |          |       |
| Campania         |         |         |         |         |          | 0.334 |
| (SE)             |         |         |         |         |          |       |
| Puglia           |         |         |         |         |          | 0.539 |
| (SE)             |         |         |         |         |          |       |
| Basilicata       | 1.879   |         | 0.681   |         | -2.632   |       |
| (SE)             | (0.682) |         | (0.154) |         |          |       |
| Calabria         | 1.779   |         | 0.836   |         | -4.325*  | 0.790 |
| (SE)             | (0.297) |         | (0.081) |         |          |       |
| Sicilia          | 2.756   |         | 0.811   |         | -4.431*  | 0.398 |
| (SE)             | (0.210) |         | (0.073) |         |          |       |
| Sardegna         | 2.290   | 0.195   | 0.693   |         | -3.682   | 0.996 |
| (SE)             | (0.564) | (0.058) | (0.200) |         |          |       |

The parameters reported in this table correspond to the parameters of the long run solutions of (5). "UR" is the BDM test for cointegration: one asterisk and two asterisks indicate 5% and 1% level of significance, respectively. "EX" is the p-value of the test of exogeneity of the contemporaneous regressors. The test is not computed when only lagged variables enter (5). SE is the standard error. We could not find any significant long-run relationship for Campania and Puglia.

cointegration. In southern regions results are mixed. There are two regions (Campania and Puglia) for which we do not find any long run relationship among the selected variables; in other two instances (Molise and Basilicata) we find a significant long run relationship, but the p-values of the cointegration tests result close to 25%.<sup>14</sup>

A potential problem with these empirical estimates is that sample sizes are small. We check the robustness of our findings as follows: first, we pool the available time series and cross section information into two groups, one for the North and one for the South, and test for cointegration in panel data. Second, we estimate for each group dynamic error correction models using the method of generalized moments (GMM).

Our cointegration tests are applied to (5) and are based on the technique developed by Pedroni (1999). Pedroni's tests apply to panel data and consist of computing residuals-based statistics to test the null hypothesis of no cointegration against the alternative of cointegrating (and heterogeneous) vectors. The cointegration tests are originally seven, but we rely on those with higher power in the specific context of our panels.<sup>15</sup> In particular, we use the panel variance, the panel ADF and the group ADF statistics, after allowing two lags in the dynamic specification. While the former two statistics pool across regions the autoregressive coefficients of the residuals, the latter test allows the autoregressive coefficient to vary across regions under the cointegration hypothesis, thereby adding an additional source of heterogeneity in the panel. Table 2 reports our results. When we do not include a trend among the regressors, all the tests reject the null of no cointegration at 5% level. If an heterogeneous trend is included, panel and group ADF still reject lack of cointegration between  $u_{it}$  and  $\mathbf{x}_{it}$ .

The evidence in favor of cointegration in the two groups of regions is used to estimate dynamic error correction models for each group. We start from

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<sup>14</sup>Exogeneity tests cannot reject the null in all the regions.

<sup>15</sup>Pedroni (1997) simulates the level of significance and power of the tests under several scenarios. Given the fact that we have 31 years and 7 or 8 regions, we rely on the tests which performed better in Pedroni's simulations with 20 years and 20 panel observations.

Table 2: Panel cointegration tests

| Northern Regions  |          |                     |
|---|----------|---------------------|
|   | no trend | heterogeneous trend |
| panel v-stat  | 1.976    | 0.295               |
| panel ADF   | -1.818   | -2.388              |
| group ADF   | -1.742   | -2.557              |
| # regressors  |          | 4                   |
| Nobs  |          | 217                 |
| Southern Regions  |          |                     |
| panel v-stat  | 2.014    | 2.439               |
| panel ADF   | -3.053   | -3.727              |
| group ADF   | -3.181   | -3.888              |
| # regressors  |          | 4                   |
| Nobs  |          | 248                 |
| Note: All statistics are one-tailed tests. Critical value at 5% level is 1.645 for panel v-stat and -1.645 for the remaining tests. |          |                     |

the following dynamic panel specification

$$\Delta u_{it} = a_i + \rho \Delta u_{it-1} + \Delta \mathbf{x}_{it} \boldsymbol{\delta} + \lambda \Delta \pi_{it} + \xi \Delta \pi_{it-1} + \theta [u_{it-1} - \mathbf{x}_{it-1} \boldsymbol{\beta}] + \mu_{it} \quad (6)$$

where  $\Delta \pi$  is the change in the inflation rate, that should capture important short-term dynamics, as suggested by Layard *et al.* (1991), and simplify sequentially the dynamic structure by eliminating the variables in first differences with an insignificant coefficient. In the estimates, we handle the region specific effect  $a_i$  as a fixed effect, by introducing regional dummies. Moreover, we treat  $\Delta u_{it-1}$ ,  $\Delta \mathbf{x}_{it}$  and  $\Delta \pi_{it}$  as endogenous and use the generalized methods of moments (GMM) estimator. The estimates of the final specification are shown in Table 3.

The table confirms that the long run elasticity of unemployment to labor taxes is significantly higher in the North than in the South (3.959 versus 0.963). The Wald test rejects at the 5% level of confidence the null hypothesis that the difference between these elasticities be equal to zero. Reassuringly, these numbers are very similar to the average elasticities computed from Table 1.



Table 3: GMM estimates. Fixed effects. Sample period: 1965-1995. Dependent variable:  $\Delta u_{it}$

|                      | North           | South          |
|----------------------|-----------------|----------------|
| $\Delta\pi$          | -1.607** (.492) | -              |
| $\Delta\pi_{t-1}$    | -4.015** (.660) | -              |
| $\Delta\tau_L$       | -               | 1.408** (.266) |
| $\Delta p_m$         | -               | -.223** (.048) |
| $\Delta\zeta_{t-1}$  | .539** (.187)   | -.495** (.139) |
| $\Delta\tau_{L,t-1}$ | -               | .916** (.217)  |
| $\Delta R_{t-1}$     | -.016** (.007)  | -              |
| $u_{t-1}$            | -.382** (.050)  | -.284** (.055) |
| $\tau_{Lt-1}$        | 3.959** (1.097) | .963 (.710)    |
| $\zeta_{t-1}$        | -.677** (.291)  | .776** (.172)  |
| $p_{m,t-1}$          | .127** (.054)   | -.217** (.077) |
| $R_{t-1}$            | -.059** (.018)  | -.030* (.018)  |
| Wald Test            | [.000]          |                |
| Nobs                 | 203             | 232            |
| J test               | [.068]          | [.096]         |
| R <sup>2</sup>       | 0.39            | 0.29           |

Note: robust standard errors within parentheses. Each regression includes regional dummies. Endogenous variables:  $\Delta\pi$ ,  $\Delta R$ ,  $\Delta\zeta$ ,  $\Delta p_m$  and  $\Delta\tau$ . Additional instruments are:  $\Delta R_{t-2}$ ,  $\Delta\zeta_{t-2}$ ,  $\Delta p_{m,t-2}$ ,  $\Delta\tau_{t-2}$ ,  $\Delta R_{t-3}$ ,  $\Delta\zeta_{t-3}$ ,  $\Delta p_{m,t-3}$ ,  $\Delta\tau_{t-3}$ ,  $\Delta\pi_{t-1}$ ,  $\Delta\pi_{t-2}$ ,  $\Delta g_{t-1}$ ,  $\Delta g_{t-2}$ ,  $\Delta g_{t-3}$ ,  $\Delta u_{t-2}$ ,  $u_{t-2}$ , where  $\pi$  and  $g$  are the national inflation rate and the share of public employment in the labor force respectively. The P-values of the test of overidentifying restrictions (J test) and of the Wald test for the regional difference in the estimated elasticity of unemployment to average labor taxes within brackets. One and two stars when the estimated coefficient is significantly different from zero at the 10% and 5% level of confidence.

To summarize, the key finding in this section is that the long run elasticity of unemployment to changes in the labor tax wedge is significantly higher in the Northern regions than in the South. Expressed in terms of the model in Section 1, the estimated value of  $\gamma_1$  in the North (0.226) is more than 50% higher than in the South (0.147). How do we explain this result? The natural thing to do is to look at the relationship between labor taxes and the real (gross) wage.<sup>16</sup>

## 4.2 Labor Taxes and Gross Real Wages

The key parameter  $\gamma_1$  in (4) suggests that wage determination is important and that one should consider whether there are significant regional differences in the sensitivity of real gross wages to the labor tax wedge *and* to regional unemployment.

We study whether gross industrial real wages differ across regions in their sensitivity to regional labor taxes and unemployment by using data for 8 industries during the period 1980-95, by pooling regional data for each industry<sup>17</sup> and by estimating a dynamic version of (2). We use industrial data for two reasons: 1) sectorial bargaining is the core of the Italian bargaining system; 2) we can distinguish regional differences into the component driven by composition effects (between sectors) and the component originated by differences within sectors.

We report in Table 4 the estimated parameters  $\beta_1$  and  $\beta_2$ , that refer to the responsiveness of log real gross wages to the unemployment rate and to log labor taxes respectively. For each group of regions, we compute the average estimated  $\beta_1$  and  $\beta_2$ , using as weights regional employment shares. The table shows that there are significant regional differences within sectors in the long run responsiveness of real gross wages to changes in labor taxes. This responsiveness is higher in the North in 5 sectors (Chemicals, Machinery, Vehicles, Textiles and Private Services) and higher in the South in the remaining 3 sectors (Foodstuffs, Building and Other Manufacturing). The

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<sup>16</sup>“...the unemployment effect of labor taxes depends crucially on the wage setting institutions.” (Daveri and Tabellini, 2000, p.52).

<sup>17</sup>We use a shorter period because of data availability.

Table 4: Long Run Elasticities of Real Gross Wages to Changes in Labor Taxes. FGLS Estimates. Dependent Variable:  $\Delta (w - p)$ . Sample period: 1980 to 1995.

| Sector                     | $\beta_2$ North | $\beta_2$ South | $\beta_1$ North | $\beta_1$ South |
|----------------------------|-----------------|-----------------|-----------------|-----------------|
| Chemicals                  | .987**          | .959**          | -.544**         | .408            |
| Engineering: Machinery     | .875**          | .415            | -.484           | -.832**         |
| Engineering: Vehicles      | 1.004**         | -.019           | -.672**         | -.065           |
| Foodstuffs                 | .742**          | .853            | .208            | 1.219**         |
| Textiles                   | .713**          | .141            | -.509           | .023            |
| Other Manufacturing        | .266            | .528            | -.616*          | .011            |
| Building                   | .457**          | .754*           | -2.005**        | -1.155**        |
| Private Services           | .347*           | .087            | -1.056**        | -.589**         |
| Average                    | .583            | .339            | -.873           | -.469           |
| Fixed Coefficients Average | .505            |                 |                 |                 |

Notes: two stars and one star when the estimated elasticity is significantly different from zero at the 5 percent and at the 10 percent level of confidence respectively.

average responsiveness, weighted by the relative employment share, is lower in the South than in the North. Notice that pure sectorial composition effects explain only part of the difference between the North and the South: if we apply to the Southern distribution of employment the elasticities found in the Northern regions, the average elasticity is 0.505, significantly above the estimated value (0.339). Therefore, there is a genuine regional variation that originates within industrial sectors.

We also find evidence that in most sectors the semi-elasticity of industrial gross wages to the regional unemployment rate is higher in the North than in the South. Moreover, the average semi-elasticity is about twice as high in the North.

We can use our estimates of  $\gamma_1$ ,  $\beta_1$  and  $\beta_2$  to derive from (4) the elasticity of labor demand to changes in the real gross regional wage,  $\alpha_3$ . It turns out that this elasticity is equal to 0.586 in the North and to 0.544 in the South. The estimated difference in these elasticities is small and suggests that the regional variation in the sensitivity of unemployment to labor taxes is driven mainly by differences in regional wage determination. Gross wages in the

North are more responsive both to labor taxes and to regional unemployment. While these effects have opposite influence on  $\gamma_1$ , the former effect prevails and generates a higher sensitivity of unemployment to labor taxes.

In the next section, we ask whether the observed differences in the elasticity of regional gross wages to labor taxes,  $\beta_2$ , which are only partly explained by "between industries" composition effects, can be accounted for by the regional variation in the institutions that affect wage determination.

## 5 Regional differences in wage determination

The theoretical relationship between the tax wedge and unemployment is strictly related to wage setting. This relationship may differ across industrial sectors and wage bargaining may also assume different characteristics in geographical areas reflecting specific socio-politic environments. Wage determination in Italy is characterized by three levels of bargaining. General issues, including income policy, pension benefits and rules of the game are bargained at the national level and involve the government, the representatives of the national association of employers and the leaders of the three major national union federations. Collective bargaining takes place at the sectorial level and involves the sectorial union and employer federations, with some degree of government arbitration. At this stage the bargain is about sectorial wage floors, that have wide coverage in the industry. The final stage is local bargaining, that involves a single firm and is about local wage premia over the sectorial floor.<sup>18</sup>

While the former two levels are shared by all Italian regions, regional differences in wage determination can occur in the final stage because the relative importance of wage drift, defined as the wage increase negotiated at the local level above the industrial wage, varies significantly across regions.<sup>19</sup> There are at least two pieces of evidence in support of this variation. First, the percentage of employees in the industrial sector involved in local wage settlements during the years 1995-6 was higher than 40% in the North and

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<sup>18</sup>In this paper we ignore pay increases decided unilaterally by the employer (merit pay).

<sup>19</sup>See Ordine (1996) for a detailed discussion of wage drift in Italy.

close to 15% in the South (Rossi and Sestito, 2000). Second, Corneo and Lucifora (1997) use data from 3000 Italian establishments to estimate a probit model of the probability that local bargaining takes place. They find that this probability is significantly lower in the Southern regions. Overall, this evidence suggests that local bargaining is more widespread in the Northern regions than in the rest of the country.

The fact that local bargaining is more widespread in the North should be combined with the other fact that collective bargaining at the sectorial level has occurred for most of the sample period every 3 or 4 years. When labor taxes increase between rounds of collective bargains, as in the sample period considered in this paper, local bargaining gives unions the opportunity to recontract and shift part of the additional tax burden away from net wages. This argument suggests that the gross wage should be more sensitive to increases in labor taxes in the regions where local bargaining is more widespread.

A potential argument going in the opposite direction is that regional wages in the South are closer to the wage negotiated at the sectorial level (tariff wage). Since this wage imposes a sort of minimum wage across the board, there is less room for downward adjustment of net real wages. Therefore, the gross real wage should be more sensitive to increases in labor taxes in the South. This argument goes through when collective bargaining set minimum wages *net* of taxes. This is not the case of Italy, however, where the tariff wage (*salario minimo contrattuale*) is set gross of income taxes.<sup>20</sup>

While local bargaining generates local wages as markups of the tariff wage, the hidden economy can be conceived of as an informal local bargaining arrangement that marks these wages down with respect to sectorial wage settlements. An informal or hidden labor market operating side by side to the regular labor market is a typical feature of the Italian labor market. Importantly, the estimated share of informal employment over total employment is significantly higher in Southern Italy. According to recent estimates produced by ISTAT (1998), during the years 1985-1995 this share was on average equal to 33.8% in Southern regions, almost twice as much as the

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<sup>20</sup>We are grateful to Michele Salvati for having suggested this point.

share in the Northern and Central regions (17.7%). Regional differences in the relative importance of the informal sector induce additional variation in the sensitivity of regional gross wages to changes in labor taxes since in the informal sector labor taxes are not paid and there is no need to adjust local pay to tax changes.

Overall, this discussion leads us to expect that in regions where the wage drift is more widespread there is a higher sensitivity of gross wages to labor taxes. This view is presented more formally in the model of the wage drift presented in Appendix A.

## 6 Implications and conclusions

Recent studies of the European unemployment problem have emphasized the importance of national institutions. Yet in a number of countries the key aspect of high and rising unemployment in the 1980s and 1990s has been the increased regional dispersion of unemployment rates.

In this paper we have studied the relationship between average labor taxes and unemployment in Italian regions. There are two key results. First, labor taxes matter for unemployment. Second, and despite similar national labor market institutions, the relationship between unemployment and labor taxes varies significantly in Italy across groups of regions and is stronger in the highly industrialized North than in the less developed South. This result is driven by the higher sensitivity of regional wages to changes in labor taxes in the North. We have identified two sources of variation in regional labor markets that affect regional wages in the expected direction, composition effects and the wage drift.

These findings have an interesting policy implication. It is often advocated that a higher decentralization of the wage bargain could help ameliorating the European unemployment problem. When decentralization is obtained by adding local to central bargaining (wage drift), it can lead to an increase in the sensitivity of gross real wages to changes in labor taxes. In such circumstances, a tax cut becomes more effective in reducing unemployment.

Overall, our results suggest that, in order to explain regional dispersion in the unemployment rate, perhaps the most important feature of the recent unemployment experience in Italy (as well as in other European countries), one needs to look within national institutions. We not only confirm recent findings that labor taxes matter for unemployment, but we also add to the existing evidence by showing that in Italy average labor taxes seem to matter most where unemployment is less of a problem.

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## A Taxes and regional wage determination

In this appendix we show some theoretical reasons why we expect that the response of wage determination to taxes can be different across regions. We assume a two-stage wage bargaining framework. At the first stage a tariff wage, which is a minimum wage, is set by central negotiators. The tariff wage represents a threshold value for local unions and employers second stage bargain. We assume that bargaining is over wages only and employment is unilaterally set by firms after wage settlements. In what follows, we focus on the second stage bargain, the local one.

Consider a firm and a local union that bargain over the local wage by taking the tariff wage, determined at the central or industrial level, as given. The firm  $k$ , in sector  $j$  and region  $i$ , produces with the following CES technology

$$Y_{kij} = [\gamma (E_{kij})^\rho + (1 - \gamma) K_{kij}^\rho]^\frac{1}{\rho} \quad (7)$$

where  $Y$  is real value added,  $E$  is labor and  $K$  is capital. By operating in a monopolistic environment *à la* Dixit and Stiglitz, the firm sells output along the following demand function

$$Y_{kij} = \chi \left( \frac{P_{kij}}{\bar{P}} \right)^{-\theta} \quad (8)$$

where  $P_{kij}$  is the price of the firm  $k$ 's good,  $\bar{P}$  is the corresponding average price, and  $\chi$  is an aggregate demand index. Profit maximization yields the pseudo labor demand

$$E_{kij} = \left[ \left( 1 - \frac{1}{\theta} \right) \gamma \right]^{\frac{1}{1-\rho}} \left( \frac{W_{kij}(1+t_{kij})}{P_{kij}} \right)^{\frac{1}{\rho-1}} Y_{kij} \quad (9)$$

where  $W(1+t)$  is the total labor cost which includes payroll taxes  $t$ . The local union bargains over the local wage with the firm, by taking (9) into account. The union cares only about the local wage and tries to maximize the distance between this wage and the tariff wage, i.e. the wage drift. Preferences are given by a CRRA utility function

$$V_{kij} = E_{kij}^\delta \left[ \frac{(W_{kij}^N)^v}{v} - \frac{(W_j^c)^v}{v} \right], \quad 0 \leq \delta \leq 1, \quad v \leq 1 \quad (10)$$

where  $W^N = W(1-\phi)/\bar{P}$  is real consumption wage net of income taxes  $\phi$ , and  $W_j^c$  is the industrial tariff wage. Notice that the parameter  $\delta$  represents the weight given to employment in local bargain. Local wage setting maximizes the Nash function

$$\max_{W_{kij}} V_{kij}^\xi \Pi_{kij} \quad (11)$$

where  $\xi$  is the relative bargaining power of the union and we assume for simplicity that the fallbacks are zero. Therefore, in the event of no settlement, union wage gains are zero and the local wage is equal to the tariff wage.

The bargained net real wage turns out to be

$$(W_{kij}^N)^v = (1 + \nu\eta_{kij})^{-1} (W_j^c)^v \quad (12)$$

where

$$\eta_{kij} = \left( \frac{\varepsilon_{kij}^\pi}{\xi} + \delta \varepsilon_{kij}^E \right)^{-1} \quad -1 \leq \eta_{kij} \leq 0 \quad (13)$$

with  $\varepsilon^\pi$  and  $\varepsilon^E$  being the elasticities of profits and employment to gross wages. Notice that

$$\begin{aligned} \lim_{\xi \rightarrow 0} (1 + \nu\eta_{kij})^{-1} &= 1 \\ \lim_{\varepsilon^\alpha \rightarrow -\infty} (1 + \nu\eta_{kij})^{-1} &= 1 \quad (\alpha = \pi, E) \end{aligned} \quad (14)$$

so that if the union bargaining power decreases, the wage mark-up disappears and the same occurs if elasticities are very large. In this setup, changes in the tax wedge defined as  $\tau = [\bar{P}(1+t)] [P(1-\phi)]^{-1}$  affect the local wage, conditional on the tariff wage, because they affect the elasticities.<sup>21</sup> In the

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<sup>21</sup>Following Hamermesh (1986),  $\varepsilon^E = -(1-s) \frac{1}{1-\rho}$  with  $s = \gamma \left(\frac{Y}{E}\right)^{-\rho}$ . Eliminating subscripts and considering that  $\frac{W}{P}(1+t) = W^N \frac{\bar{P}}{P} \frac{(1+t)}{(1-\phi)} = W^N \tau$ , we have

$$\varepsilon^E = - \left[ \frac{1}{1-\rho} - \frac{1}{1-\rho} \left( 1 - \frac{1}{\theta} \right)^{-1} \frac{E}{Y} W^N \tau \right]$$

and

$$\varepsilon^\pi = \frac{-\frac{E}{Y} W^N \tau}{1 - \frac{E}{Y} W^N \tau}$$

where  $(1-\rho)^{-1}$  is the elasticity of substitution.

rest of this section, we capture this effect by assuming  $\eta_{kij} = \eta(\tau_{ij})$ . Using (12), an increase in the labor tax wedge leads to an increase in the ratio between the local and the tariff wage if  $\frac{\partial \eta_{kij}}{\partial \tau_{ij}} < 0$ .

Industrial wages in each region are obtained as weighted averages of the wages of firms belonging to the same industry. Let  $\sigma_{ij}$  be the proportion of firms in region  $i$  and industry  $j$  that have local bargaining. This proportion can vary with the tax wedge when the parties have an incentive to adjust the net real wage to changes in labor taxes that occur after the tariff wage has been set. In implicit form, this is equivalent to assuming  $\sigma_{ij} = \sigma(\tau_{ij})$ . The incentive to bargain locally is stronger when the contract length of sectorial contract is significant, as it happens in Italy, where contracts are negotiated every 3 or 4 years, and the labor tax wedge can change between settlements.

With the simplifying condition that the parameters associated to local bargaining, to the technology and to product demand do not vary among the firms belonging to the same region and sector, and assuming further that  $v = 1$ , net real wages in region  $i$  and sector  $j$  are given by

$$W_{ij}^N = \left\{ \frac{\sigma(\tau_{ij})}{[1 + \eta_{ij}(\tau_{ij})]} + [1 - \sigma(\tau_{ij})] \right\} W_j^c = \lambda_{ij} W_j^c \quad (15)$$

Therefore, in any industry and region, the sensitivity of the net real wage to changes in the labor tax wedge depends on the sensitivity of the tariff wage, a common industry effect, on the change in the proportion of firms that bargain locally and on the sensitivity of the local wage to tax changes. Since the latter two effects can vary across regions within the same industry, the presence of wage drift can introduce regional variation in the sensitivity of regional wages to regional labor taxes.

The log of the local wage varies with the log of the average tax wedge as follows

$$\frac{\partial \ln W_{ij}^N}{\partial \ln \tau_{ij}} = \frac{\partial \ln W_j^c}{\partial \ln \tau_{ij}} + \frac{1}{\lambda_{ij}} \left[ \left( \frac{1}{1 + \eta_{ij}} - 1 \right) \sigma_{ij} \frac{\partial \ln \sigma_{ij}}{\partial \ln \tau_{ij}} - \frac{\sigma_{ij}}{(1 + \eta_{ij})} \frac{\partial \ln \eta_{ij}}{\partial \ln \tau_{ij}} \right]. \quad (16)$$

The first element within brackets captures the effect of a percentage change in the share of firms that bargain locally; the second element measures the impact of labor taxes on the net local wage of firms that bargain

locally. The latter effect is larger the higher the share of firms with local wage bargains.

## B Data sources

The data used in this paper are obtained from regional accounts and from labor force surveys. The sample period is 1965-1995. The main sources are:

### *Regional accounts data:*

- ISTAT, Conti economici regionali. Anni 1980-95; SVIMEZ, I conti economici del Centro-Nord e del Mezzogiorno nel ventennio 1970-89, Il Mulino, 1993; ISTAT, Annuario di contabilità nazionale, 1986; Unioncamere, I dati regionali 1963-1974, Franco Angeli Editore, Milano, 1976; Tirloni, C. and Veronese, G., Banca dati regionali 1960-1991, Fondazione ENI Enrico Mattei; CRENOS, Base dati per le regioni italiane 1960-1993, Cagliari 1997; Rossi, N., Sorgato, A. and Toniolo, G., I conti economici italiani: una ricostruzione statistica 1890-1990, in Rivista di Storia Economica, n.10, 1993.

### *Labor force data:*

- ISTAT, Statistiche del Lavoro, vol. 26, 1986; ISTAT, Occupazione e redditi da lavoro dipendente 1980-1994, 1995; ISTAT, Indagine sulle forze di lavoro.

### *Interest rates in the main macro areas and price of energy:*

- Bank of Italy, Statistical Bulletin, several years

The Italian National Statistical Institute (ISTAT) measures hidden employment and earnings by combining information from the labor force survey, a household survey, with the information provided by firms, used to compile the national accounts. As a result of this measurement effort, regional gross wages include both earnings and employment in the regular sector and an estimate of the earnings and employment in the informal economy. This is consistent with the new system of European national accounts ESA 1995.

## C The estimate of the regional labor tax wedge

The regional wedge is the ratio of payroll and labor income taxes over gross wages. Payroll taxes in Italy are paid both by employers and by employees. Social security contributions paid by employers have by far the largest share of payroll taxes. For the period 1980 to 1995 they are directly available from the regional accounts. For the period before 1980, we have computed the national payroll tax rate and adjusted it on a regional basis by using the information on payroll tax rebates (*fiscalizzazione e sgravi degli oneri sociali*) provided by Malfatti (1994).

There are no readily available data on the regional distribution of social security contributions paid by employees. We have assumed that the share of these taxes on gross wages in each region be equal to the national share. Labor income taxes have also been estimated. For the period before the fiscal reform of 1974 the income tax revenue is estimated by adding up different tax items (*imposta sulla ricchezza mobile* and *imposta complementare*). For the period after the tax reform, we have used tax legislation and the information on income distribution by region provided by ISTAT, *Indagine sui consumi delle famiglie italiane*, to estimate total labor tax revenue by region.